INFLUENCE OF ELECTRET EFFECT ON FILTER AND DIVIDING CAPABILITIES OF POLYMER NONWOVENE MATERIALS

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Annotation. The effect of the corona discharge on the sorption properties of polymeric nonwoven materials is shown. It was found that imparting the electret state to samples increases the time it takes for the filtrate to pass through the filter, but the quality of the filtrate is better.

Today filters play a big role in society. One of the main elements of the installations is non-woven polymeric webs, unique properties and structure which allow separating liquids from elements of solids. The application scope of such webs is not limited to filtration, it is quite wide, thus, the improvement of their properties is very relevant today.

One of the ways to modify polymeric materials is their transfer to the electret state [1]. The issues of changing the complex of material properties during electret (including filtering), the interaction of the electric field of the electret with the surrounding substances remain unexplained.

The work purpose was to study the filtering and separation ability of nonwoven polymeric webs and electrets based on them. The study objects were non-woven webs «Spunbond» with a density of 17 and 20 g/m^2 (S17 and S20 respectively), electrets based on them (ES17 and ES20) and the filtrate-perfume liquid.

The effectiveness of the webs to ensure the purity of the filtrate was studied in determining the separation capacity of filter materials (Fig. 1a).

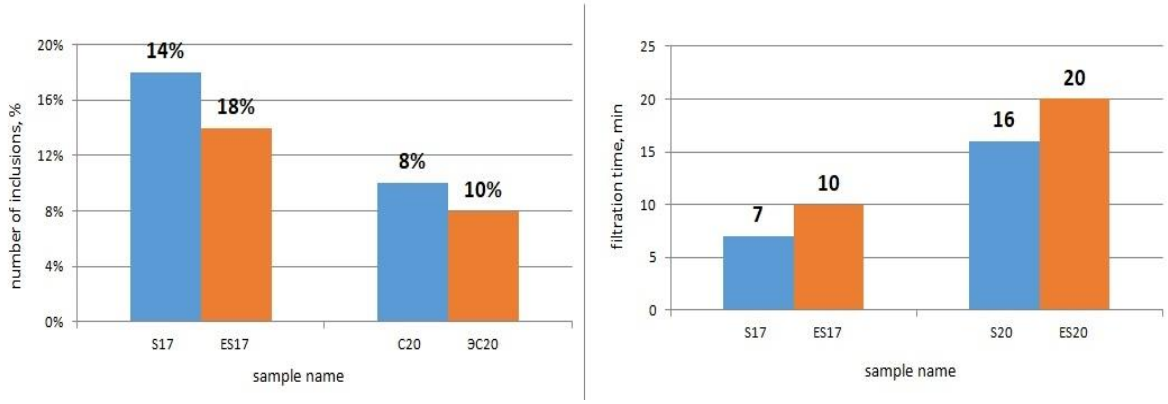

Fig. 1. Results of tests for the determination of separation ability (a) and filtration rate of samples (b).

In Figure 1a you can see that the density of the canvases affects their retention capacity. This is explained by the fact that with the increase of this characteristic the number and length of fibers increases, their tortuosity and the increase in the number of barriers for solid particles.

Giving the electrets state to the samples led to a decrease in the number of particles in the filtrate by an average of 22% compared to the original samples. The deposition of solid particles on charged fibers occurs due to the attraction of neutral particles of inclusions by the forces of charged fibers due to an increase in the electrokinetic potential of the surface of nonwoven polymeric fabrics while imparting an electret state.

At the same time, the filtration time after giving the samples an electrets state increases almost 1,3 times (Fig. 1b). Electrophysical factors have a significant effect when a fluid flows through the pores of the material. A special role is assigned to the action of the electret charge. The polarization charge creates an energy barrier that affects the passage of the filtrate through polymer nonwoven webs [2]. The change in the rate of mass transfer is explained as follows. The diffusion coefficient of dielectric fluids is inversely proportional to the dynamic viscosity. Viscosity increases in the electric field. Hence, the action of the electric field leads to a decrease in the diffusion coefficient.

So, when electretising materials, the filtering time increases by 25% and the purity of the resulting filter increases by 22%.

1. Sessler G.M. Electrets. Third edition in two volumes, Laplacian Press, Morgan Hill (1999).
2. Galikhanov M.F. Unipolar Corona Discharge Effect on Filtering Capacity of Polypropylene Non-Woven Fabrics, Fibre Chemistry (2017).

MAGNETIZATION REVERSAL IN GdCo ANTIDOT FILMS WITH PERPENDICULAR ANISOTROPY

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Influence of nanoscale antidot lattices on magnetization reversal processes in GdCo films with strong perpendicular anisotropy has been investigated. Lattice parameters have been set by choosing substrates prepared by anodizing aluminum foils in appropriate conditions. We have studied the influence of the nanoscale local curvature on magnetization processes by comparing flat antidot films, antidot films with curvature, and continuous films with curvature.

Recently magnetic antidot films have drawn significant attention from both fundamental and applied standpoints. In particular, the precise control over the local magnetization distribution makes antidot lattices promising candidates for magnetic memory applications and spin waves logic elements in magnonics. In this work we consider magnetization reversal processes in GdCo antidot lattice with strong out-of-plane anisotropy taking into account additional curvature features resulting from the synthesis process.